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RECORDED

15. *Mashing
Processes*99
51

195. ALCOHOL.

Mashing.

Patent 1879, 27th NOVEMBER. N° 4848.

All

Obtaining and Preparing Wort.

LETTERS PATENT to Friedrich Tillmann, of Arsbrück, in the Empire of Germany, Engineer, for the Invention of "IMPROVEMENTS IN THE METHOD OF OBTAINING AND PREPARING WORT AND IN APPARATUS THEREFOR."

Sealed the 27th January 1880, and dated the 27th November 1879.

COMPLETE SPECIFICATION filed by the said Friedrich Tillmann at the Office of the Commissioners of Patents on the 27th November 1879.

FRIEDRICH TILLMANN, of Arsbrück, in the Empire of Germany, Engineer. "IMPROVEMENTS IN THE METHOD OF OBTAINING AND PREPARING WORT AND IN APPARATUS THEREFOR."

To obtain a complete extraction of wort the following conditions should be fulfilled:—

1. A complete conversion of the more or less easily soluble amylin into dextrin and sugar.

10 2. A most complete solution and transformation of protéids into that durable and resisting state which is required to produce a slowly fermenting and fullbodied beer.

3. To prevent the origin of injurious products in the useful constituents of the malt.

15 In the hitherto used method of preparing wort these conditions have been but partly attained and in a very incomplete manner, as will be shown by the following consideration:—

1. The complete conversion of amylin into dextrin and sugar (dextrose, maltose) only takes place when the amylin is submitted in a dissolved state and 20 with a temperature between 40-75° C. to the influence of unaltered diastase not yet destroyed by an excessive temperature. The efficient saccharifying constituent of the diastase, the maltine, shows the highest energy (according to Dubrunfaut) at a temperature of 35-55° C., while it is fully destroyed by a temperature of about 75°.

25 Now the malt contains besides the easily soluble amylin (starch) likewise a less soluble amylin, and the latter is only convertible after having been brought into a glutinous state, that is to say, after having been submitted to a temperature exceeding 75° C.

[Price 6d.]

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On account of these conflicting conditions the less soluble amylin must be agglutinated at a high temperature before the diastase is present, and after this operation it must be submitted to the saccharifying influence of a solution of diastase of lower temperature.

This problem is fully solved by my new method and in the following way:— 5

The clarified mash which contains the diastase is taken up from the returns, and the latter, containing the un-dissolved constituents of malt, is submitted to the influence of intense steam pressure. After this manipulation they are again mixed with clarified mash of a lower temperature.

With the method of infusion used in England the saccharifying temperature is 10 obtained by the infusion of hot water, and all constituents of malt are not submitted to a higher temperature and agglutination is not obtained. With the method of decoction used in Bavaria the saccharification is produced by partial cooking.

By the decoction maltine is destroyed, and that less soluble amylin remaining in the mash-tun and not submitted to cooking within the thick-mash pan or boiler 15 has not been agglutinated. In fact, according to the researches of Balliny, Muscullus, and Lerner, only 50-52 percent of the available quantity are obtained.

2. The most complete solution and transformation of proteids to get a slowly fermenting and durable full bodied beer can only be obtained by the influence of a high temperature upon the azotic constituents of the malt. 20

By my new improved method this purpose is completely obtained by the influence of hot steam of high pressure upon the proteids, whilst by the method of decoction only certain parts are properly transformed by the influence of the higher temperature, because but a partial decoction, the thick mash decoction, of the azotic constituents of malt takes place. 25

3. To prevent the formation of products such as acetic acid, mucic acid, butyric acid, propionic acid, and other hitherto unknown acids, it is necessary to exclude totally the influence of the atmosphere during the chemical reaction.

The metamorphose and the transformation of the elementary bodies are not processes of oxydation, they are rather alterations of the molecules with partial 30 taking up of the elements of water.

To prevent the aforesaid inconveniences, and to obtain the advantages of a rational manipulation, I have invented the new and improved apparatus shown in the annexed Drawing, in which represent,—

A, the mash-tun; B, the closed wort apparatus; C, hotwater tank; a, conducting tube between A and B; b, communication and stop cock between A and B; c, tube from the hotwater tank C to the closed wort apparatus B; d, pressure gauge; e, testing cock; f, steam conduit from the steam boiler to the wort apparatus; g, filter bottom within the wort apparatus; h, outlet cock or valve from the wort apparatus to the pan; i, man hole to evacuate residues from the wort apparatus. 35 40

In my new and improved closed apparatus herein described the air cannot have any influence, as it is filled either by steam or by the mash. With the other methods hitherto in use, and with their combinations, the atmosphere comes frequently into contact with the mash and with the returns in the open vessels. With regard to the said facts my improved method is as follows:— 45

The mash having been subjected in one or the other known way to the temperature of saccharification in the mash-tun A the lower situated wort apparatus B is filled and the mash subjected in it to pressure without increase of temperature. This manipulation performed, the whole clarified mash containing the maltine is forced by the steam coming from the tube f to return to the tun A through the 50 tube a.

The steam passes in this way through the returns, which contain the undissolved amylin, and the proteids remaining upon the filter-bottom.

Both are subjected in this way to a high temperature, whilst the maltine of the clarified mash has already been removed with its low temperature. 55

The returns having been subjected for some time to the influence of steam the clarified mash of a lower temperature is again removed from the mash tun A to the

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apparatus B and causes the transformation of the agglutinated amylin into dextrin and sugar, whilst the transformed proteinous bodies are dissolved.

This simple process is repeated, partly for completing the chemical reaction, partly to obtain the reduction (deoxidation) of the albuminates by high 5 temperature.

The finished wort being totally clarified in the apparatus B is now drawn off. This operation is performed either in one draught by means of hot water coming from the hot water tank C through the tube c, and by means of hydrostatic pressure in the required concentration, or by drawing off a first wort by means of 10 steam pressure and afterwards a second wort by means of hot water flowing from the hot water tank C through tube c by hydrostatic pressure. Now in both cases an affusion is drawn off, which may be properly used in the place of water to the next mashing.

Recapitulation:—With my new method the following principles are brought to 15 application:—

a. An exact and punctual succession of the influence of those temperatures which are found most suitable for the different constituents of malt and the totality of all constituents.

b. Substitution of higher temperature by pressure, or the simultaneous use of 20 high temperature and pressure.

c. The direct use of the physical and chemical action of steam besides its application for obtaining mechanical work, and

d. The exclusion of the atmosphere during the chemical processes and 25 transformations. By the application of this principle the following advantages are obtained in comparison with the methods hitherto known and used:—

1. A complete conversion of the more or less soluble amylin into dextrin and sugar.

2. The most perfect extraction of the proteids within the limits corresponding to the purpose of obtaining light or dark colored more or less full bodied beer, extract 30 of malt, or malt sugar.

3. No loss of useful substances by the formation of deleterious products.

4. The production of durable beers.

5. Most complete extraction by the application of pressure.

6. To use the immediate physical and chemical reaction of steam and obtaining 35 from it at the same time mechanical effect instead of applying pumps.

Having thus clearly explained my Invention, and in what manner it may be brought to practical effect, I claim as new,—

The new and improved method of preparing and producing wort for the purpose of subsequent production of beer, extract of malt, or malt sugar, in closed air-tight apparatus with the exclusion of atmospheric air, and with a simultaneous 40 application of pressure and steam of a temperature and pressure varying according to the products to be obtained, substantially as described and set forth.

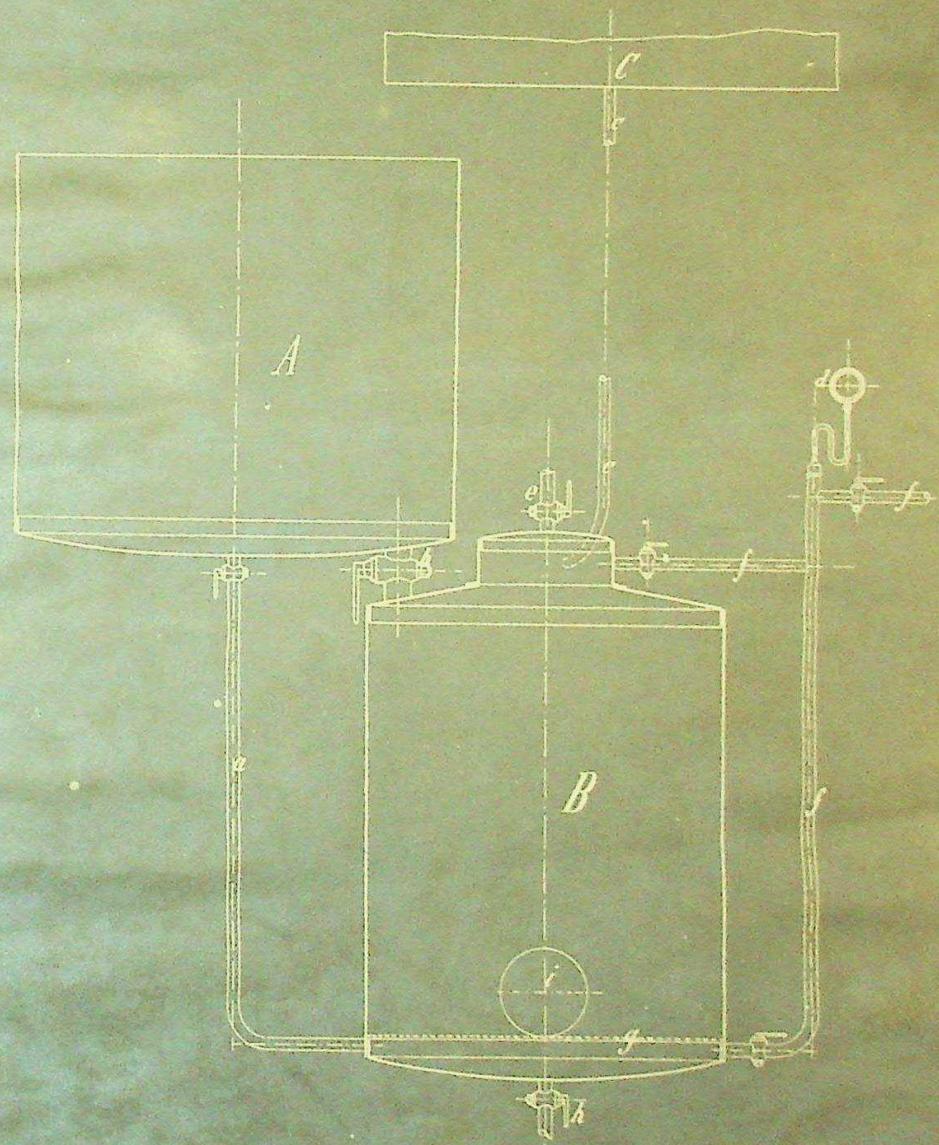
In witness whereof, I, the said Friedrich Tillmann, have hereunto set my hand and seal, this Thirteenth day of November, A.D. 1879.

FRIED. TILLMANN. (L.S.)

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